

FIVE NEW SPECIES OF *EREMOPHILA* (MYOPORACEAE) FROM WESTERN AUSTRALIA

R. J. Chinnock

State Herbarium, Botanic Gardens, North Terrace,
Adelaide, South Australia 5000

Abstract

Five new species of *Eremophila*, namely *E. falcata*, *E. linearis*, *E. punctata*, *E. spinescens* and *E. undulata* are described from central Western Australia. Each species is illustrated and distribution maps are provided.

Introduction

When I published an account of a number of new species of *Eremophila* from central and Western Australia (Chinnock, 1979) it was partly in preparation for the Myoporaceae treatment in the forthcoming "Flora of Central Australia". At that time I had been aware of five other undescribed species from the central Western Australian region but due to the inadequacies of the available collections I delayed publishing the species until I had visited the region. In most cases information on fruit characters were lacking and in addition *E. falcata* and *E. undulata* were only known from two collections each.

During September-October last year the region where these species occur was visited and existing collections were supplemented by additional collections and field data.

Herbarium abbreviations follow Holmgren and Keuken (1974) except for Kings Park Herbarium, Perth, which is designated KP.

1. *Eremophila falcata* Chinnock sp. nov.

Frutex viscidus glaber glandulifero-punctatus; *foliis* alternis falcatis crassis viscidis; *sepalis* non imbricatis obovatis vel spatulatis obtusis extra glabris interne glandulifero-papillatis; *corolla* alba vel purpurascens-rosea villosa, lobis obtusis; *staminibus* glabris; *ovario* ovoideo glandulifero-pubescenti, pilis longioribus villosi; *stylo* glabro; *fructu* ovoideo lateraliter compresso. (Fig. 1)

Type: R.J. Chinnock 4807, 19.3 km SW of Mt Vernon, 24.ix.1979, fl.fr. (holotype: AD; isotypes: CANB, PERTH).

Glabrous glandular-papillate viscid shrub to 2 m. *Branches* whitish-grey, distinctly flattened in young parts but eventually terete, with prominent tubercles restricted to short ribs which extend from the leaf bases down the branch, glabrous. *Leaves* alternate, sessile, thick, falcate or more rarely linear and sigmoid in outline, mucronate, margins entire, (15-) 19-31 (-36) x (1-) 2-5.5 (-6.5) mm, viscid, shiny. *Flowers* 1-2 (-4) in the leaf axils, pedicellate; pedicel 2.5-4.5 mm, slightly compressed. *Sepals* 5, not imbricate, obovate to spatulate, obtuse, enlarging slightly after flowering, 2.2-5.5 x 0.7-2 (-2.6) mm, glabrous outside except for the sparsely ciliate margins, densely glandular-pubescent inside. *Corolla* 10-18 mm, white to pale purplish-pink, the lowermost lobe spotted yellow to brownish-yellow; upper four lobes obtuse, lowermost one dilated and emarginate; villous outside often with numerous shorter glandular hairs; the lowermost lobe densely villous inside extending down the tube to the base of the stamens. *Stamens* 4, included; filaments and anthers glabrous. *Ovary* ovoid, 1.8-2.5 x 0.8-1.5 mm, finely glandular-pubescent with longer villous hairs particularly towards the base; style glabrous. *Fruit* dry, crustaceous, ovoid, beaked, laterally compressed, (3.5-) 4-6 x 2-2.7 mm, viscid, indumentum as for ovary. *Seed* unknown.

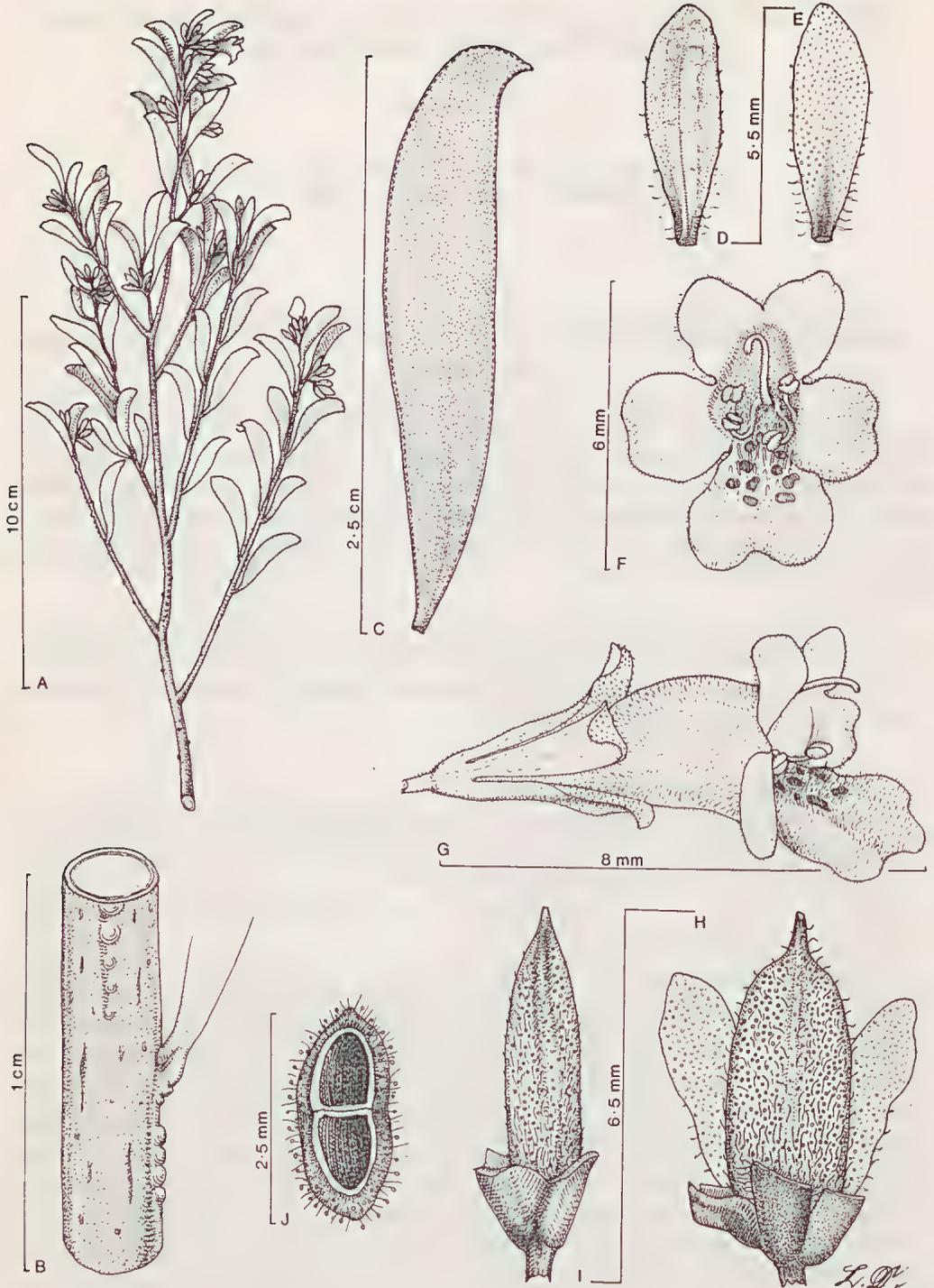


Fig. 1. *E. falcata* Chinnock. A, habit; B, enlargement of stem showing position of tubercles; C, leaf; D, E, outer and inner surface of sepal; F, G, front and side view of corolla; H, I, front and side view of fruit; J, cross-section of fruit showing the two loculi. (A-D, H-J, Mitchell 223, E, F, Chinnock 4807).

Epithet derivation

The specific epithet is taken from the leaf shape.

Distribution

Extending in a narrow band from south of Neale Junction through the Carnegie Salient to the vicinity of Mt Vernon on the southern side of the Hamersley Range (Map 1).

Specimens examined

WESTERN AUSTRALIA: *R.J. Chinnock 3921*, 30.1 km SE of Mt Vernon HS, 10.ix.1977 (AD); *R.J. Chinnock 4507*, 118 km N of Rawlinna, 5.ix.1979 (AD); *R.J. Chinnock 4509*, 201.5 km N of Rawlinna, 6.ix.1979 (AD); *R.J. Chinnock 4541*, 140 km W of Neale Junction, 8.ix.1979 (AD); *R.J. Chinnock 4547*, Yeo Camp, 167.2 km W of Neale Junction, 8.ix.1979 (AD); *R.J. Chinnock 4629* 2.4 km N of Paddy's Well, 13.ix.1979 (AD); *R.J. Chinnock 4665*, 47.2 km NE of Prenti Downs, 15.ix.1979 (AD); *R.J. Chinnock 4808*, 19.3 km SW of Mt Vernon, 24.ix.1979 (AD); *R.J. Chinnock 4821*, 54.2 km SE of Mt Vernon, 25.ix.1979 (AD); *A.S. George 8464*, c. 145 miles N of Rawlinna, 12.x.1966 (PERTH); *A.A. Mitchell 223*, Mt Vernon Station, Sept. 1976 (PERTH).

Affinities

Eremophila falcata is closely allied to *E. paisleyi* F. Muell. *E. sturtii* R.Br and *E. mitchellii* Benth. of the central and eastern states and these together with a number of other undescribed species in South and Western Australia form a well-defined group of glabrous broom-like shrubs. The most distinctive features of *E. falcata* are the falcate leaves and the whitish-grey branches with prominent tubercles on short ribs, which extend down the branch from the leaf bases.

Ecology

E. falcata is usually associated with open *Acacia aneura* Benth. (mulga) woodland on red-brown clay loams over limestone. Other commonly associated species include *Atriplex vesicaria* Hew.ex Benth., *Maireana sedifolia* (F. Muell.) Wilson, *Cassia* spp. and *Eremophila* spp., especially *E. alternifolia* var. *latifolia* Benth. and *E. latrobei* F. Muell.

In the north-western part of its range in the Mt Vernon region, *E. falcata* is usually the dominant shrub where it occurs. Here it appears restricted to a number of isolated pockets on stony rises in *Eremophila/Cassia* shrubland.

2. *Eremophila linearis* Chinnock sp. nov.

Eremophila duttonii auct: J.S. Beard, West.Austr.Pl.120(1965); B.J. Grieve and W.E. Blackall, West. Austr.Wildfls 4: 652(1975). *E. duttonii* "subspecies parvifolia" Barlow, Aust.J.Bot.19: 296, 299 (1971).

Frutex vel arbor parva viscida glabra; *ramis* maxime viscidis; *foliis* alternis linearibus integris manifeste glandulifero-punctatis; *sepalis* ovatis acutis; *corolla* rubra extra glabra; *staminibus* gynoeoioque glabro; fructu late ovoideo manifeste rostrato. *Chromosomatum numerus*: n = 18. (Fig. 2)

Type: *R.J. Chinnock 4663*, 20.7 km ENE of Prenti Downs, 15.ix.1979, fl.fr. (holotype: AD; isotypes: CANB, K, MEL, PERTH).

Viscid glabrous shrub or small tree 1-4 m. *Branches* fine, 0.5-1 mm diameter, slightly compressed in the younger parts, extremely viscid and usually thickly coated with resin, glabrous, leaf bases persistent. *Leaves* alternate, sessile, densely clustered, linear, acute, entire, prominently glandular-punctate, (16-) 17-23 (-27) x (1.1) 1.2-1.8 (-2.3) mm, glabrous, extremely viscid. *Flowers* solitary, pedicellate; pedicel 9-15 mm, sigmoidly curved, glabrous. *Sepals* 5, imbricate, appressed to corolla, reflexed in fruit, ovate, acute to acuminate, sometimes uncinata, surface ± rugose, enlarging slightly at fruiting stage but not becoming scariosa or reticulate, (4-) 5.5-9 (-11) x (3-) 4-6 (-6.5) mm, glandular-papillate, glabrous. *Corolla* 25-30 mm, red above, orange to yellow below, the tube yellow inside, unspotted; upper lobes acute, lowermost lobe broadly acute to obtuse, mucronate; viscid; glabrous outside, the tube inside with long interlacing woolly hairs

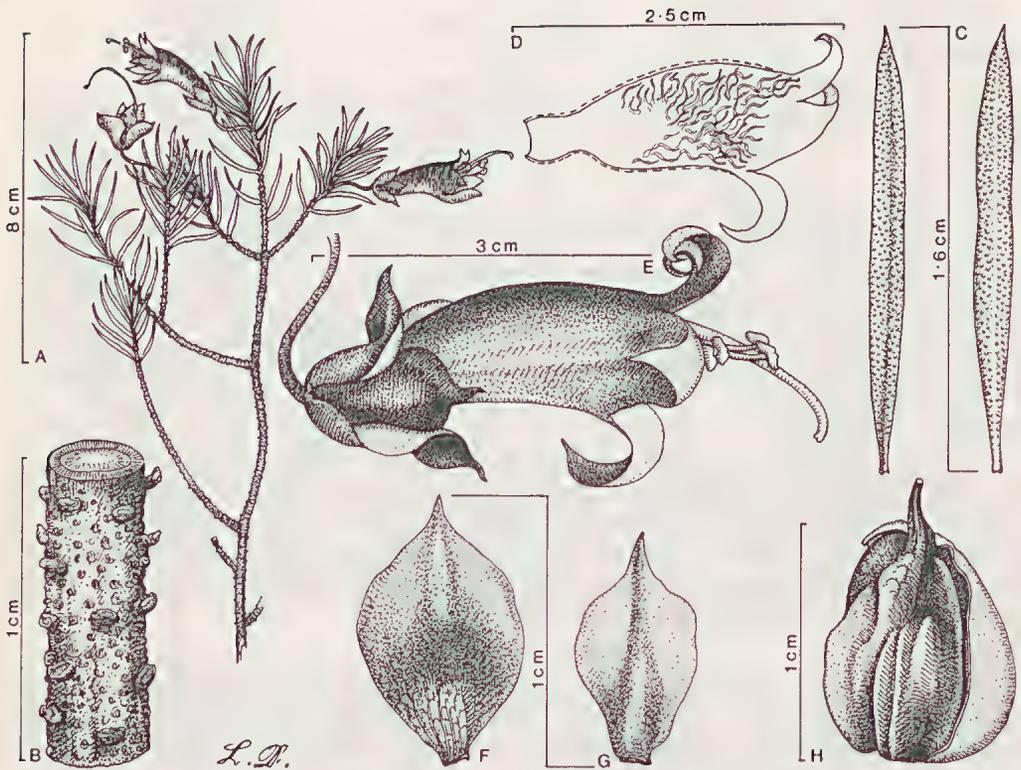


Fig. 2. *E. linearis* Chinnock. A, habit; B, enlargement of branch; C, upper and lower view of leaf surface, respectively; D, longitudinal view of corolla to show hairs on inside of corolla tube; E, side view of flower; F, G, sepals, inner and outer surface respectively; H, side view of fruits with portion of exocarp removed to show the prominently winged endocarp. (A-G, Chinnock 3972; H, Gardner s.n., 15 km N of Meekatharra).

extending to the base of the lobes, lobes otherwise glabrous. *Stamens* 4, exserted, glabrous. *Ovary* ovoid, 3-4 x 1.5-2 mm, viscid, glabrous; style glabrous or sparsely hirsute. *Fruit* broadly ovoid, prominently beaked, 8-13 x 8-10 mm, exocarp grey, papery, endocarp prominently 6-winged. *Chromosome number*: $n = 18$ (Barlow 1971).

Epithet derivation

Taken from the leaf shape which is very uniform in this species.

Distribution

Widespread in central Western Australia, especially in the Meekatharra-Wiluna region (Map 2).

Representative collections (total seen 34)

WESTERN AUSTRALIA: *T.E.H. Aplin* 2436, 29 km W of Wiluna, 22.viii.1963 (PERTH); *W.R. Barker* 1928, 3 km WNW of Paddy Well, Yelma station, 14.viii.1977 (AD); *B.A. Barlow* 1642, 18 km N of Meekatharra, 23.vi.1969 (AD); *J.S. Beard* 6552, 26 miles N of Barwidgee, 13.xi.1973 (PERTH); *R.J. Chinnock* 848, near James Pool, Windidda Station, 6.ix.1973 (AD); *R.J. Chinnock* 4686, 15.3 km NE of Carnegie, 16.ix.1979 (AD); *R.J. Chinnock* 4733, 19.7 km NW of New Springs, 19.ix.1979 (AD); *R.J. Chinnock* 4748, Gascoyne River, middle arm, 65.5 km S of Kumarina, 19.ix.1979 (AD); *A.S. George* 5565, 21 miles W of Carnegie, 27.vii.1963 (PERTH); *J. Morrissey* 17, Wiluna, Dec. 1970 (PERTH); *N.H. Speck* 1138, 38 miles NE of Meekatharra, 5.viii.1958 (CANB, MEL); *H & E Walter* 385, SE of Wiluna, 1.ix.1958 (B); *P.G. Wilson* 7445, 6 km S of Bilgarrrie Cutarrie Bore, 28.viii.1968 (PERTH).

Affinities

This species has previously been included within the circumscription of *Eremophila duttonii* F. Muell., a very closely related widespread species in the eastern and central states, which just extends over the border into Western Australia in the Warburton region, where it appears to be very rare.

Eremophila linearis is distinguished from *E. duttonii* by its more dense and finer glabrous leaves and branches and glabrous pedicel and corolla (outside). In addition plants of *E. linearis*, except old tall ones, have a broom-like habit similar to *E. scoparia* (R.Br.) F. Muell. and *E. pantonii* F. Muell., quite unlike *E. duttonii*, which has a more rigid spreading habit.

Ecology

Eremophila linearis favours heavy red-brown clay loams in areas subject to flooding such as clay depressions, river flats or outwash plains.

It is frequently associated with open mulga (*Acacia aneura*) woodland or *Eremophila/Cassia* scrubland including *Eremophila fraseri* F. Muell., *E. delisseri* F. Muell., and *E. margarethae* S. Moore.

3. *Eremophila punctata* Chinnock sp. nov.

E. sp. 5 Barlow, Aust.J.Bot.19: 296(1971).

Frutex viscidus; ramis glandulifero-pubescentibus; foliis oblanceolatis crenatis vel serratis apices versus manifeste glandulifero-punctatis glabris praeter pilos disperso ad bases marginesque: sepalis imbricatis lanceolatis vel late depresso-obovatis acutis glandulifero-pubescentibus; corolla lilacina et purpurea sparsim pilosa; staminibus glabris; ovario styloque villosa; fructu late ovoideo reticulatim costato. Chromosomatum numerus: n = 18. (Fig. 3)

Type: R.J. Chinnock 4680, 57.2 km NE of Carnegie near the Gunbarrel Highway, 16.ix.1979, fl.fr. (holotype: AD; isotypes CANB, K, MEL, NT, PERTH).

Erect, viscid shrub 0.5-1.5 m. Branches weakly ribbed, glandular-pubescent, leaf bases persistent \pm appressed. Leaves alternate, sessile, thick, spreading, oblanceolate with the base cuneate and the apex obtuse; margins irregularly serrate or crenate towards the apex or rarely entire; surfaces prominently glandular-punctate; (5-) 9-16 (-26) x (1.5-) 1.8-3.5 (-5.7) mm, glabrous except for a few glandular hairs towards the base and on the margin.

Flowers solitary or rarely paired, pedicellate; pedicel (3-) 4.2-20 (-25) mm, glandular-pubescent. Sepals 5, imbricate, green to purple, lanceolate to ovate to very widely depressed obovate, the inner ones slightly narrower, apex acute, (7.5-) 10-16 (-20) x (2.5-) 3.4-9 (-13) mm, glandular-pubescent on both surfaces. Corolla 20-30 mm, pale lilac to purple, the tube inside cream spotted purple; lobes acute; sparsely hairy outside, densely hairy within the tube, the lobes glabrous inside. Stamens 4, glabrous. Ovary ovoid to oblong, 2.5-3.2 x 101.8 mm, villous; style villous except in the uppermost part. Fruit dry, broadly ovoid, splitting towards the apex, reticulately ribbed, 5.5-6.5 x 4.3-5.5 mm, villose. Chromosome number: n = 18 (Barlow 1971).

Epithet derivation

The epithet is taken from the prominently punctate nature of the leaves.

Distribution

Eremophila punctata is endemic to Western Australia extending from the Great Victoria and southern Gibson Deserts westwards to near Meekatharra (Map 3).



Fig. 3. *E. punctata* Chinnoek. A, habit; B, enlargement of branch; C, upper surface of leaf; D-F, variations in leaf apices; G, side view of flower; H, gynoeceium; I, sepal; J, K, side and cross-section of fruit (A-C, G-I, R.J. Chinnock 782, D, J-K, Gardner 7872, E, Barlow 1823, P, Speck 1190).

Representative specimens (total seen 23)

WESTERN AUSTRALIA: *B.A. Barlow 1828*, 42 miles W of Wiluna, 29.vi.1970 (AD); *A.C. Beauglehole 60075* and *E.G. Erray 3775*, 372 km NE of Laverton on the Warburton road, 17.ix.1978 (AD); *R.J. Chinnoek 782*, Beru Pool, Yelma Station, 5.ix.1973 (AD); *R.J. Chinnoek 4546*, 137.8 km W of Neale Junction, 8.ix.1979 (AD); *R.J. Chinnoek 4651, 4652*, von Truer Tableland, 11.6 km S of Prenti Downs, 15.ix.1979 (AD); *R.J. Chinnoek 4676*, hills 87.6 km NE of Carnegie, 16.ix.1979 (AD); *A.R. Fairall 2034*, summit of Mt Everard, 27.vii.1966 (KP, PERTH); *C.A. Gardner 7872*, 36 miles E of Meekatharra, 16.x.1945 (PERTH); *N.H. Speck 1139*, Glengarry Range, 5 miles SE of Mooloogool Homestead, 5.vii.1958 (CANB); *N.H. Speck 1418*, 2 miles S of Lorna Glen Homestead, 10.ix.1958 (CANB, PERTH); *P.G. Wilson 7365*, 56 km NE of Bandya Homestead, 27.viii.1968 (PERTH).

Affinities

Features of the flower including the large imbricate sepals, the corolla structure and the villous ovary and fruit clearly ally this species to *E. granitica* S. Moore. It differs by its flat, oblanceolate, prominently glandular-punctate leaves which are usually crenate or serrate towards the apex and the much smaller ovoid fruit.

Ecology

In the situations in which I have observed this species it has always occurred on skeletal clay loams in rocky situations, especially on breakaways.

4. *Eremophila spinescens* Chinnoek sp. nov.

Frutex humilis divaricatus; *ramis* spinescentibus; *foliis* alternis sessilibus oblanceolatis integris vel aliquot dentibus; *sepalis* imbricatis ellipticis vel obovatis glabris, glandulifero-pubescentibus vel hirsutis; *corolla* caerulea vel atropurpurea; *vittis* duobus prominentis nigro-purpureis secus tubum extensis; *ovario* ovoideo villosis; *stylo* glabro vel hirsuto; *fructu* ovoideo vel subgloboso villosis. (Fig. 4)

Type: *R.J. Chinnoek 4683*, 24.4 km NE of Carnegie Homestead, 16.ix.1979, fl.fr. (holotype: AD, lowermost specimen; isotypes: AD, CANB, K, MEL, NT, PERTH, US).

Low divaricate spinescent shrub 0.3-0.5 m tall. *Branches* terete, the tips becoming spinescent, hairy with long, stiff, white hairs interspersed with numerous, shorter, glandular ones. *Leaves* alternate, sessile, green to green-tinged-purple, linear to oblanceolate, entire or sometimes with a few scattered teeth, often fascicled on short lateral branches, deciduous during drought, (2.5-) 3.3-19 (-25) x (0.5-) 0.8-2.6 (-3.8) mm, sparsely hairy. *Flowers* solitary, pedicellate; pedicel hirsute, glandular-pubescent or glabrous. *Sepals* 5, imbricate, green to blackish-purple, unequal, elliptic to obovate, obtuse or acute, (3.5-) 4-8 (-8.7) x (1.8-) 2.1-3.3 (-3.8) mm, hirsute, glandular-pubescent or glabrous outside, glandular-pubescent within. *Corolla* 15-20 mm, pale blue to dark purple, the tube inside cream with two broad blackish-purple bands extending down the tube from the base of the lateral lobes; upper lobes broadly acute, lowermost lobe dilated, obtuse, densely villous, glandular-pubescent to almost glabrous outside, the lobes glabrous within, the tube densely hairy on the upper side and around the base of the stamens. *Stamens* 4, included; filaments sparsely hirsute; anthers glabrous. *Ovary* ovoid, 2.5-4 x 1-2 mm, densely villous; style hirsute or glabrous. *Fruit* subglobular, 4.5-7 mm, villous.

Epithet derivation

The specific epithet alludes to the spinescent habit of the species.

Distribution

Eremophila spinescens is widespread throughout the Carnegie salient and extending to the edge of the Gibson Desert (Map 4).

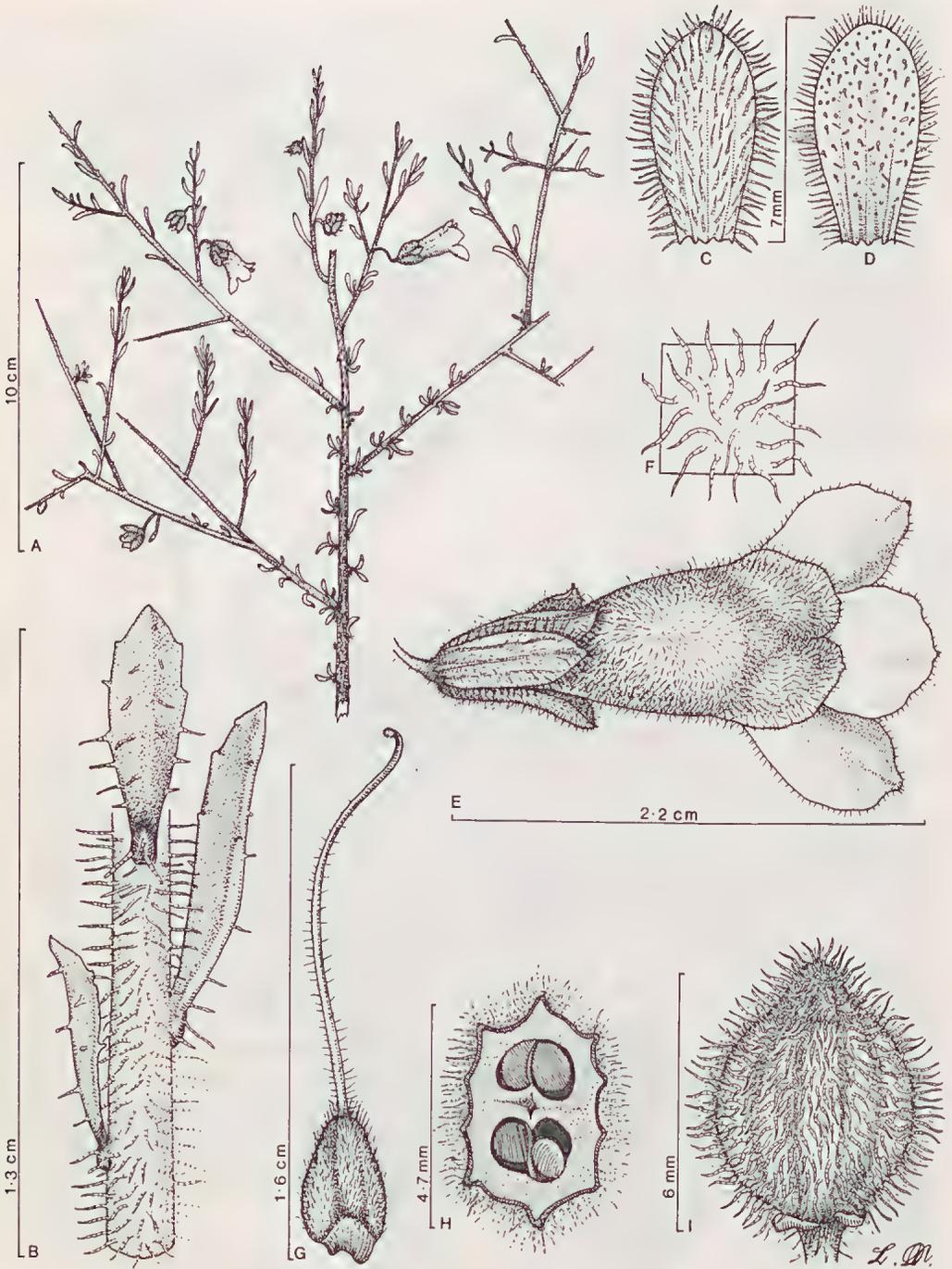


Fig. 4. *E. spinescens* Chinnock. A, habit; B, enlargement of branch with leaves; C, D, outer and inner surface of sepal; E, upper view of flower; F, corolla hairs; G, gynoecium; H, I, cross-section and side view of fruit. (A-I, George 5520).

Specimens examined

WESTERN AUSTRALIA: *W.H. Butler s.n.*, Lake Naberu, Aug. 1964 (PERTH); *R.J. Chinnock 760*, Beru Pool, 5.ix.1973 (AD); *R.J. Chinnock 4596*, 16.1 km S of Wiluna, 12.ix.1979 (AD); *R.J. Chinnock 4600*, 74.6 km ESE of Wiluna, 12.ix.1979 (AD); *R.J. Chinnock 4614*, 131 km E of Wiluna, 12.ix.1979 (AD); *R.J. Chinnock 4623*, Beru Pool, 13.ix.1979 (AD); *R.J. Chinnock 4632*, 12 km E of Windidda, 13.ix.1979 (AD); *R.J. Chinnock 4715*, 8.4 km NE of Earraheedy, 17.ix.1979 (AD); *R.J. Chinnock 4716*, 10.3 km NE of Granite Peak, 17.ix.1979 (AD); *R.J. Chinnock 4740*, 27.7 km E of Great Northern Highway on Ned's Creek road, 19.ix.1979 (AD); *A.R. Fairall 1966*, 61.1 miles Wongawal to Carnegie Station, 26.vii.1966 (KP); *C.A. Gardner 7931*, 11 miles S of Wiluna, 17.x.1945 (PERTH); *A.S. George 5520*, 14 miles E of Carnegie Homestead, 27.viii.1963 (PERTH); *N.H. Speck 1348*, Barwidgee road, 7 miles S of Yelma, 1.ix.1958 (CANB, PERTH); *P.G. Wilson 7400*, near Colurabi Hills, c. 195 km N of Laverton, 28.viii.1968 (PERTH).

Affinities

This species is allied to *E. battii* F. Muell. It differs in having spinescent branches, the presence of glandular hairs on the branches, pedicels and sepals and the linear to linear-oblong flattened leaves.

Ecology

Eremophila spinescens is common throughout the Wiluna-Lake Carnegie region in depressions or on the margins of salt lakes on light brown to red-brown clay loams. It is usually associated with *Frankenia* spp., *Hemichroa* sp., *Eremophila pterocarpa* W.V. Fitzg. and chenopodiaceous shrubs including *Rhagodia spinescens* R.Br., *Arthrocnemum* spp., *Maireana* spp. and *Sclerolaena* spp.

5. *Eremophila undulata* Chinnock sp. nov.

Frutex parvus; *ramis* pilis longis albis ramosis vestitis; *foliis* alternis petiolatis, lamina undulata stellato-pubescenti; *sepalis* imbricatis ovatis vel ovato-oblongis, pilis longis simplicibus ramosisque tectis; *corolla* virello-brunnea glandulifero-pubescenti, lobis acutis; *staminibus* exsertis glabris; *ovario* oblongo glabro; *fructu* subgloboso glabro. (Fig 5)

Type: *A.S. George 11939*, 88 km S of Neale Junction, Great Victoria Desert, Western Australia, fl. immature fr. (holotype: PERTH; isotype: CANB).

Small shrub to 0.5 x 1 m. *Branches* terete, densely clothed with long white branched hairs and shorter substellate ones, leaf bases persistent. *Leaves* alternate, distinctly petiolate, petiole 5-11 mm, terete, clothed with long, white, branched hairs; lamina oblong to elliptic, undulate, margins repand, apex obtuse, (20-) 22-30 (-33) x (5-) 6-10 mm, stellate-pubescent. *Flowers* solitary, pedicellate; pedicel terete, sigmoid, 12-17 mm, clothed with long, simple and branched, white hairs. *Sepals* 5, imbricate, ovate to ovate-oblong, enlarging slightly after flowering, 6.5-8.5 x 2.5-4 mm, covered outside with long, simple and branched, white hairs. *Corolla* 15-20 mm, greenish-brown to yellowish-green, lobes acute, the lowermost one reflexed, glandular-pubescent outside and within. *Stamens* exserted, glabrous. *Ovary* oblong, obtuse, glabrous; style glabrous. *Fruit* dry, sub-globular, 6-7 mm long and broad, exocarp papery, endocarp irregularly ribbed ± reticulate, 2 ribs often larger, wing-like.

Epithet derivation

The specific epithet refers to the undulate lamina, a feature of this species.

Distribution

Eremophila undulata is known only from the Great Victoria Desert S of Neale Junction on the Rawlinna road (Map 4).

Specimens examined

WESTERN AUSTRALIA: *R.J. Chinnock 4510*, 249.3 km N of Rawlinna, 6.ix.1979 (AD); *B.C. Crisp 58*, c. 16 km S of Neale Junction, 22.v.1974 (AD).

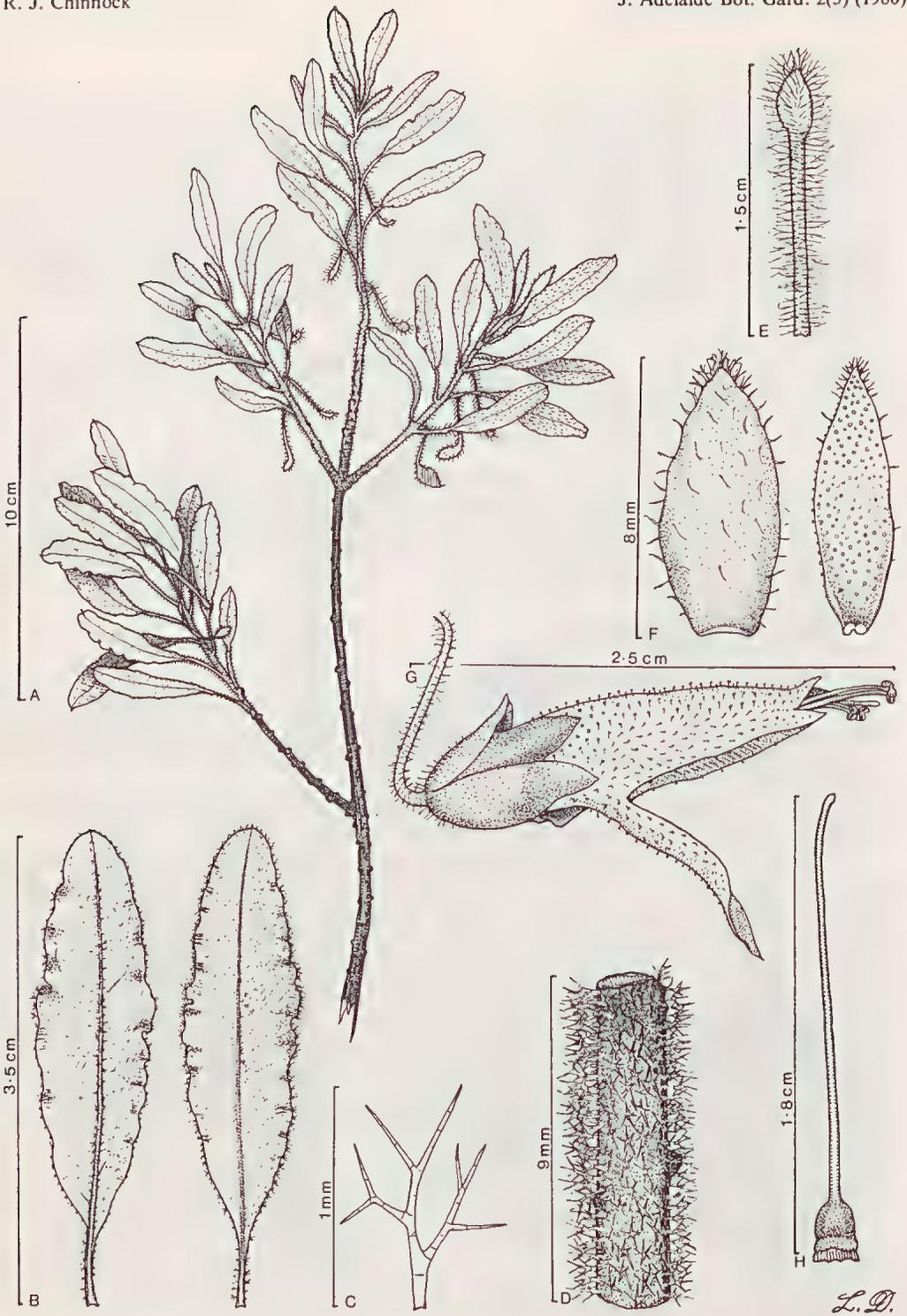


Fig. 5. *E. undulata* Chinnock. A, habit; B, lower and upper surface of leaf respectively; C, branched hair of stem; D, enlargement of branch to show hairs; E, flower bud; F, outer and inner surface of sepals; G, side view of flower; H, gynoecium. (based on type).

Affinities

Eremophila undulata is closely allied to *E. serrulata* (A. Cunn. ex A.DC.) Druce. It differs in its smaller compact habit, the long, white, branched and simple hairs on the branches and sepals and the undulate lamina with prominent stellate hairs.

Ecology

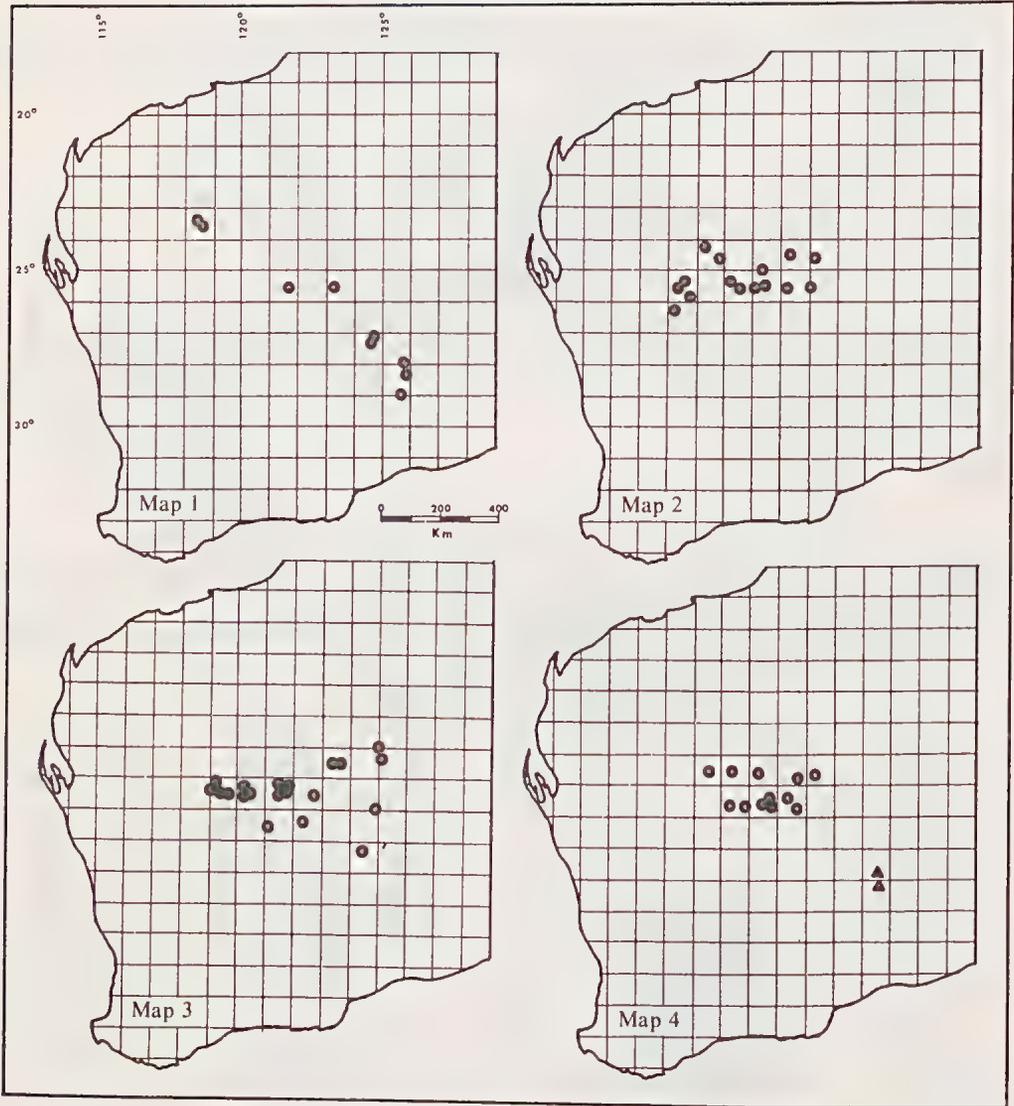
This species is known only to grow on red-brown clay loams in mulga woodland where it is very common under the trees and in open situations amongst spinifex (*Triodia* sp.).

Acknowledgements

I wish to thank Mr Ludwik Dutkiewicz for preparing the illustrations and Dr John Jessop and Dr Bryan Barlow for their interest in the preparation of this paper.

References

- Chinnock, R.J. (1979). Ten new species of *Eremophila* (Myoporaceae) from Central and Western Australia. *J. Adelaide Bot. Gard.* 1:237-262.
- Holmgren, P.K. & Keuken, W. (1974). 'Index Herbarium, Part I. The Herbaria of the World.' (Utrecht: Oosthoek, Scheltema & Holkema).



Distributions of *Eremophila* species.
Map 1, *Eremophila falcata*. Map 2, *E. linearis*. Map 3, *E. punctata*. Map 4, *E. spinescens* (spots), *E. undulata* (triangles).